REMARKS

This application, as amended herein, contains claims 15, 17-27, 29, 34-36 and newly added claims 47-51. Claims 1-14, 28 and 37-46 have canceled without prejudice or disclaimer, and may be presented in one or more divisional applications.

The Applicants and the undersigned thank the Examiner for the indication of allowability of claims 33 and 34. Claim 30 has been amended to include the recitations of dependent claims 31 and 33, and is therefore in a condition for allowance. Further, claim 34 has been amended to depend from claim 30, and is thus also in a condition for allowance.

Claims 15-17, 19, 21, 23, 25 and 27 were rejected as. anticipated by Jan et al. Claim 18 was rejected under 35 U.S.C. 103 as obvious over Jan et al. in view of Lee. Claims 20, 22, 24 and 26 were rejected as obvious over Jan et al. Claims 30-32 and 35 were rejected as anticipated by Jan et al in view of admitted prior art. Claim 36 was rejected as anticipated by Jan et al in view of admitted prior art and further in view of Liang. These rejections are respectfully traversed.

Claim 15 has been amended herein to state that the solder is predominantly Sn, lead free and eutectic. Support for the amendments may be found at page 10, line 6 and page 13, line 7 of the specification. This provides an advantageous and environmentally friendly approach for

forming an interconnection structure suitable for flip-chip attachment of microelectronic device chips to packages. Claim 15 is not anticipated by or obvious over Jan et al.

Newly added claim 47, which depends from claim 15, states that the predominantly Sn lead free solder contains greater than 90 % by weight Sn. Support for this amendment may be found at page 7, lines 4-6 of the specification. It is submitted that neither Jan et al. nor any of the other art of record teach or suggest the method of claim 47.

Newly added claim 48, which also depends from claim 15, states that the predominantly Sn lead free solder contains one or more alloying components selected from the group consisting of Cu, Zn, Ag, Bi and Sb, whereby the lead-free solder substantially avoids alpha particle emission and induced soft logic errors which result therefrom. Support for this amendment may be found in the specification at least at page 10, lines 6-11. It is submitted that neither Jan et al. nor any of the other art of record teach or suggest the method of claim 48.

Newly added claim 49, which depends from claim 17, states that the solder wettable layer comprises Cu. Support for this amendment may be found throughout the specification, and, for example, in original claim 31. It is submitted that neither Jan et al. nor any of the other art of record teach or suggest the method of claim 49.

Newly added claim 50 depends from claim 49 and states that the solder wettable layer is a Cu layer having a

thickness of 1-6 microns. Support for this amendment may be found in the specification at page 15, line 29, to page 16, line 2. This thick layer provides sufficient copper so that the composition of the resulting solder ball may be controlled. A eutectic composition may be produced. It is submitted that neither Jan et al. nor any of the other art of record teach or suggest the method of claim 50.

Newly added claim 51 is similar to allowable claim 30, but states that the lead free solder is substantially pure Sn. Further claim 51 combines the recitations of claims 30, 31 and 32, and adds the additional recitation of the solder being formed during reflowing as a binary Sn-Cu eutectic lead-free solder. Support for this amendment may be found in the specification at page 12, line 15 and page 18, lines 8-11.

Neither Jan et al. nor Barnak et al teach or suggest the method of claim 51. As noted in the specification, at page 18, lines 14-16, "The dissolution and incorporation of Cu as an added alloying element in solder is shown to particularly simplify the plating processes." Further, as noted in the specification on page 18, line 20 to page 19, line 3:

> The same approach is applied to the plating of pure Sn which is very simple, and the subsequent reaction of pure Sn with Cu, which is from the BLM pad, to form a simple binary alloy. This is much simpler than the plating of a binary Sn-Cu alloy. Maintaining the bath chemistry and precise control of solder composition during the plating of multicomponent solder alloys is very complicated, and this complexity can be avoided using this approach. It is noted that the Cu rapidly diffuses into the essentially liquid solder during the reflow

portion of the process, thus assuring that the composition of the solder ball is relatively uniform.

Thus, the method of claim 51 has the advantage of simply and easily providing an environmentally friendly eutectic and lead free solder composition that greatly simplifies forming an interconnection structure suitable for flip-chip attachment of microelectronic device chips to chip carriers. In view of these advantages, which are not taught or even remotely suggested by the prior art, it is submitted that claim 51 is directed to patentable subject matter.

The remaining claims depend from one of the independent claims discussed above. These claims recite further elements, which in combination with the elements of the independent claims, are not shown or suggested in the art of record. For the reasons set forth above with respect to the independent claims, it is submitted that the dependent claims are directed to patentable subject matter.

In view of the above, it is submitted that all of the claims are patentable over the art of record. Allowance of this application is respectfully requested.

Applicants request an extension of time of three months for the filing of this paper. A check for $1,020 to cover the fee is enclosed.

Respectfully submitted,

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